# ENABLING SYSTEM FOR AN IMPLEMENT CONTROLLER

## Field of the Invention

**[0001]** The invention relates to work vehicles having multiple position swivel seats and implement controllers that are easily operated. More particularly, the invention relates to loader backhoes with easily operated implement controllers.

## Background of the Invention

**[0002]** Traditional control systems for backhoes have included floor mounted hydraulic levers with a sufficient resistance to movement and an adequate distance from the swivel seat to avoid inadvertent operation. Some have included rudimentary enablement conditions, e.g., an operator's presence switch that detects a weight on the vehicle seat, to activate the traditional controllers. Still others have included systems with pilot controllers that automatically enable and disable the pilot controllers in accordance with seat orientation, i.e., enablement typically requires a seat orientation in the direction of the controls to be enabled.

## Summary of the Invention

**[0003]** Many modern controllers such as, for example, pilot controllers and electro-hydraulic controllers (hereafter implement controllers) are, by their very nature, easy to manipulate and conventional enablement systems may not provide adequate assurance that the backhoe tool will be manipulated only by deliberate acts of the operator. Accentuating this problem is the fact that the controller towers on which the implement controllers are usually mounted tend to be relatively close to the seat.

**[0004]** The invention provides an enabling system giving greater assurance than conventional systems that the operator will manipulate the backhoe tool only in a deliberate manner. The enabling system accomplishes this by requiring the existence of enablement conditions and a deliberate act of the operator for enablement of the implement controllers. There are two types of implement controller enablement according to the invention: (1) ideal enablement; and (2) non-ideal enablement.

**[0005]** Ideal enablement requires the following enablement conditions: (1) the swivel seat, often associated with backhoes, is in a backhoe operating position and not in another operating position; (2) the ignition switch is in a power on state; and (3) an implement controller toggle switch is toggled to a state for implement

controller enablement while ideal enablement conditions (1) and (2) exist. Thus, ideal enablement of the implement controller occurs only if the operator toggles the implement controller toggle switch to the state for implement controller enablement after and while power is on in the work vehicle and the seat is in the backhoe operating position. If, after implement controller enablement, any one of the conditions change, the implement controller is automatically disabled. The implement controller is ideally re-enabled only after the ideal enabling conditions are, once again, established.

**[0006]** Non-ideal enablement requires the following conditions: (1) the swivel seat is not in the backhoe operating position; (2) the ignition switch is in a power on state; and (3) the implement controller toggle switch is toggled to a state for implement controller enablement while non-ideal enablement conditions (1) and (2) are true. Thus, non-ideal enablement is, in essence, an override condition in which the implement controller toggle switch acts as an override switch. The operator is reminded that non-ideal enablement is in effect via a visual alert from a display of a monitor and/or an audible sound from a speaker of a monitor. The reminder may be a singular one time alert, a periodic alert or a constant alert.

**[0007]** The non-ideal enablement allows the operator to perform multiple functions when necessary. Thus, an operator may swivel his seat to the loader operating position or to a position between the backhoe operating position and the loader operating position and manipulate his shovel or move his vehicle while, at the same time, manipulating his backhoe work tool. Swiveling the seat into or out of any position disables the implement controller requiring re-enablement before control is, once again, established.

**[0008]** The enabling system achieves the best results when the vehicle is functioning properly but may be required during a malfunction of the vehicle. Thus, an option is provided in which an accumulator maintains backup hydraulic pressure for the backhoe functions allowing the operator to lower the backhoe instrument to the ground in a controlled fashion should the engine stop or fail.

## Brief Description of the Drawings

**[0009]** Embodiments of the invention will be described in detail, with references to the following figures, wherein:

Fig. 1 is a view of a work vehicle in which the invention may be used;

Fig. 2 is a block diagram illustrating an exemplary embodiment of the operation of the invention;

Fig. 3 is a flowchart of operating steps for the joystick enablement system; and

Fig. 4 illustrates an emergency accumulator for a backhoe system for controlling the lowering of the backhoe work tool upon inadvertent engine failure.

## Description of the Illustrated Embodiment

**[0010]** Fig. 1 illustrates a work vehicle 10 in which the invention may be used. The particular work vehicle 10 shown in Fig. 1 is a loader backhoe which, typically, has dual functions. The functions of the particular work vehicle 10 illustrated are that of a backhoe and that of a loader. The work vehicle 10 includes a cab 15, a swivel seat 20, at least one implement controller 160, a backhoe portion 50 and a loader portion 60. It also includes wheels 70 as well as a propulsion system (not shown) that propels it along the ground in a manner well known in the art. The swivel seat 20 has at least two set positions, i.e., swivel angles at which it can be locked. These set positions include at least an angle in which the swivel seat 20 faces the backhoe portion 50 and an angle in which the swivel seat 20 faces the loader portion 60; they are usually 180° apart angularly as indicated in Fig. 1. The swivel seat 20 is in the backhoe or loader operating position when it is within about 15° of each of the set positions, respectively.

**[0011]** Fig. 2 is a block diagram outlining an exemplary embodiment of the invention. Included in the diagram are: an ignition switch 100; a first seat switch 110 for indicating whether or not the swivel seat 20 is in a backhoe operating position; a second seat switch 120 for indicating whether or not the swivel seat 20 is in a loader operating position; an implement controller 160; an implement controller toggle switch 130 for enabling the implement controller 160 which also serves as an override switch; and a logic control device 150. The logic control device 150 may be

a conventional on board controller computer for the vehicle, a conventional hardwired switching mechanism or a conventional group of switches and relays arranged to effect the logic of the invention via methods well known to those of ordinary skill in the art.

**[0012]** Fig. 3 is a flowchart detailing a control loop 200 of operating steps for the invention as embodied in Fig. 2. The operating steps set forth in Fig. 3 may be incorporated into the hardware and/or software programming of the logic control device 150 via techniques well known to those of ordinary skill in the art. As shown in Fig. 2 as well as in Fig. 3, the entire process begins with step 210, i.e., a power-on state for the ignition switch 100 as this is required to initiate a flow of energy necessary for activating all other switches. As illustrated, if the ignition switch 100 is in a power-off state in step 210, the process ends immediately at step 270 and the pilot joystick controller 160 is not enabled. Once the ignition switch 100 is in a power-on state, the state of the first seat switch 110 is checked at step 220. If the first seat switch 110 is in a first seat switch first state indicating the swivel seat 20 is in the backhoe operating position, the process moves to step 230 to determine the state of the second seat switch 120. If the second seat switch 120 is not in the second seat switch first state then the process moves to step 240. If, at step 240, the implement controller toggle switch 130 is then toggled to a toggle switch first state, the implement controller 160 is ideally enabled. implement controller

**[0013]** If, at step 220, the first seat switch 110 is not in a first seat switch first state or, at step 230, the second switch is in a second seat switch first state, the process branches to step 270 and the implement controller is not enabled unless the implement controller toggle switch 130 is toggled to the toggle switch first state at step 260. If, under these conditions, the implement controller toggle switch 140 is used as the override switch and toggled to the controller switch first state the process moves to step 250, where the implement controller is non-ideally enabled, and branches to 280 where the operator is informed of a non-ideal enablement via the monitor 180 through at least one of the display 181 and the audible sound generator 190.

**[0014]** Fig. 4 illustrates an accumulator 191 that increases the reliability of the

enabling system. The accumulator 191 functions as a failsafe mechanism in the event of a catastrophic loss of hydraulic pressure provided by the engine (not shown) and hydraulic pumps (not shown). Such a failure could occur as a result of, for example, engine failure, hydraulic line failure, hydraulic pump failure, etc. Should the supplied hydraulic pressure fail, the accumulator 191 serves as a temporary pressure sustainer and allows the operator to use the implement controller 160 to appropriately return the work tool, which is typically a backhoe, to a convenient position such as a stow position.

**[0015]** Having described the illustrated embodiment, it will become apparent that various modifications can be made without departing from the scope of the invention as defined in the accompanying claims. For example, the means for seat position detection has, thus far, included two seat switches, i.e., the first seat switch 110 and the second seat switch 120. However, comparable results could be obtained with the use of a greater number of seat switches or a single seat switch.